KOTS, G.A.; RAZUMNAYA, Ye.G.; ROZHKOV, V.D.; PAVLENKO, G.G.; STEPANENKO, L.G.; ROZHKOVA, Ye.V., nauchnyy red.; ANTOKOL'SKAYA, A.M., red. izd-va; BYKOVA, V.V., tekhn. red.

[Methodical guide to the use of ore separation units for the mineralogical analysis of ores and rocks.] Metodicheskoe rukovodstvo po primeneniiu malogabaritnykh ustanovok dlia mineralogicheskogo analiza rud i gornykh porod. Moskva, Gosgeoltekhizdat, 1963. 110 p. (Moscow. Vsesoiuznyi nauchno-issledovatel'skii institut mineral'nogo syr'ia. Trudy, no.10)
(MIRA 17:1)

RAZUMNYY, Yu.N., kapitan meditsinskoy sluzhby

Potentiated local anesthesia under conditions of a garrison hospital.
Voen.-med. zhur. no.7:78-79 Jl '61. (MIRA 15:1)
(LOCAL ANESTHESIA) (AUTONOMIC DRUGS)

GETSELEV, V.; RAZUMNEVICH, V.; CHULKOVA, K., red.; SPIRIDONOV, N., tekhn.red.

[Friendship; a sketch] Druzhba; ocherk. Kuibyshevskoe knizhnoe izd-vo, 1954. 27 p. (MIRA 12:3)
(Labor and laboring classes)

EEP
.R92667

[illegible]VICH, Vladimir Luk'yanovich

Rozhdeniye goroda (Birth of a City) Kuybyshev, Kuybyshevskoye Knizhnoye Izd-vo, 1955.
23 p. port. (Stroiteli Kuybyshevskoy Gidroelektrostantsii)

4

CA

Cathode for a primary cell. N. S. Gorbunov, A. G. Razumnikov and S. S. Stefan. Russ. 31,618, Feb. 28, 1931. The cathode is a Zn alloy contg. 0.1-1.0% of Al.

METALLURGICAL LITERATURE CLASSIFICATION

L 18472-66

ACC NR: AT6004846

0

$$\tau = \frac{Q_0}{\Phi \cdot \omega} = \frac{\alpha + h + 6(c - o) - \frac{1}{3}n}{c + \frac{1}{2}(h+n)}$$

where Q_0 is the heat of combustion at 0°K; for practical purposes it can be replaced by experimentally determined heat of combustion at room temperature Q_p assuming that there is no condensation of the water vapor; Φ is quantum of chemical energy, ω is total number of moles of combustion products produced during combustion of 1 mol of starting compound, α is a chemical energy content characteristic for a given compound expressed as number of quanta of chemical energy Φ, c is a number of Φ per molecule of carbon, h is a number of Φ per molecule of hydrogen, o is a number of Φ per molecule of oxygen, and n is a number of Φ per molecule of nitrogen. The maximum combustion temperature T of an organic compound is calculated from the formula:

$$\frac{T}{1000} = \frac{1}{2}\left(\sqrt{16\tau + 1} - 1\right)$$

Card 2/3

L 18472-66

ACC NR: AT6004846

2

The accuracy of the method is ±25°. It was found that there is a linear dependence of the combustion temperature of a compound T_{comb} and the specific heat of combustion τ. The graphic method of determining the maximum combustion temperature T of a compound is based on the correlation between T and Q_p. An example of application of the graphic method is shown in figure 1. Orig. art. has: 1 figure, 4 tables, 2 formulas.

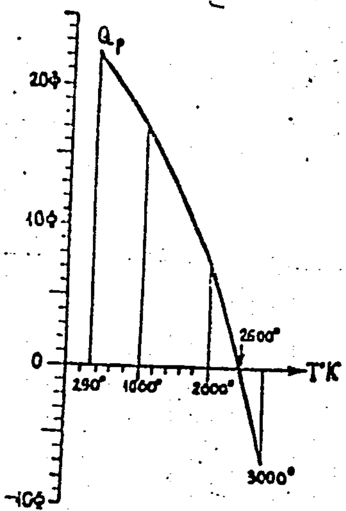

Fig. 1. The process of combustion of acetylene in stimulated air mixture.

SUB CODE: 21/ SUBM DATE: 00/ ORIG REF: 005/ OTH REF: 001

RAZUMNIKOV, A.G.

Analytical and graphic methods of determining the maximum temperature of combustion of a substance. Trudy NPI 146:27-40 '64.

Tagged atom. Ibid.:47-53

(MIRA 18:11)

RAZUMNIKOV, A.G., dotsent, kand.tekhn.nauk

Element positronium. Trudy NPI 47:159-167 '58.
(MIRA 13:5)

1. Novocherkasskiy ordena Trudovogo Krasnogo Znameni politekhnicheskiy institut imeni Sergo Ordzhonikidze; kafedra fizicheskoy i kolloidnoy khimii.
(Positronium)

[illegible] G

USSR/Electrochemistry B-12

Abs Jour : Ref Zhur - Khimiya, No 8, 1957, 26299

Author : A.G. Razumnikov
Inst : Novocherkassk Polytechnical Institute
Title : Problem of Absolute Electrode Potentials

Orig Pub : Nauch. tr. Novocherkas. politekhn. in-ta, 1956, 34/48, 109-111

Abstract : An attempt was made to compute absolute electrode potentials by the application of conceptions developed by the author (Nauch. Tr. Novocherkas. politekhn. in-ta, 1948, 19, 77; 1950, 20, 45; RZhKhim, 1956, 35269); the magnitudes obtained are shown in a table.

Card : 1/1

Разумников, А.Г.

RAZUMNIKOV, A.G., dots., kand. tekhn. nauk.

History of thermochemical laws. Trudy NPI 27:73-125 '56.(MIRA 10:12)

1. Kafedra fizicheskoy i kolloidnoy khimii Novocherkasskogo politekhnicheskogo instituta.
(Thermochemistry--History)

[illegible]

RAZUMNIKOV, A.G., dots., kand. tekhn. nauk.

The reaction rate constant as a function of temperature and activation energy. Trudy NPI 27:127-130 '56. (MIRA 10:12)

1. Kafedra fizicheskoy i kolloidnoy khimii Novocherkasskogo politekhnicheskogo instituta.
(Chemical reaction, Rate of)

RAZUMNIKOV, A. G.

Razumnikov, A. G. - "On the problem of thermochemical and content repetitions. The theory of energy centers and element content", Trudy Novocherkas. politekhn. in-ta im. Ordzhonikidze, Vol. XIX, 1948, p. 77-94, - Bibliog: 10 items.

SO: U-411, 17 July 53, (Letopis 'Zhurnal 'nykh Statey, No. 20, 1949).

KORSUNSKIY, A.A.; RAZUMNOV, I.G.

[Device for monitoring the thickness of thin films obtained by means of vacuum atomization of materials] Indikator tolshchiny tonkikh sloev, poluchaemykh metodom vakuumnogo raspyleniia materialov. Moskva, In-t tochnoi mekhaniki i vychislitel'noi tekhniki Akad.nauk SSSR, 1961. 13 p. (MIRA 15:5)

(Thickness measurement) (Electronic measurements)

SHANDOR, K., dispetcher; SORGOVSKIY, V.; STARODUBTSEV, I., doverennyy vrach (g.Sumy); RAZUMNYY, A.; TRET'YACHENKO, B.

Contrasts in Sumy. Okhr. truda i sots. strakh. 3 no.7:58-59 Jl '60. (MIRA 13:8)

1. Reydovaya brigada. 2. Sumskiy remontno-stroitel'nyy trest (for Shandor). 3. Tekhnicheskiy inspektor Sumskogo oblsovprofa (for Sorgovskiy); 4. Korrespondent gazety "Leninskaya pravda," g.Sumy (for Razumnyy). 5. Spetsial'nyy korrespondent zhurnala "Okhrana truda i sotsial'noye strakhovaniye," g.Sumy (for Tret'yachenko).
(Sumy—Industrial hygiene)
(Women--Employment)

RAZUMNYY, N.; NEMTSOVA, Ye.

Repairing deformed, detachable propeller blades. Mor.flot 15 no.3: 29-30 Mr '55. (MLRA 8:5)
(Propellers)

RAZUMNYY, V.T.; LOMAKIN, V.F.

Pulsed power supply to a great number of magnetic logical elements. Avtom.i prib. no.3:24-27 Jl-S '62. (MIRA 16:2)

1. Lisichanskiy filial Instituta avtomatiki Luganskogo soveta narodnogo khozyaystva.
(Electronic computers)

RAZUMNYY, YU. N. (Captain of the Medical Service)

"Potentiated Local Anesthesia Under Conditions of a Garrison Hospital."

7

Voyenno-Meditsinskiv Zhurnal, No. 12, December 1961, pp ~~62-73~~

RAZUMOV, A.; SIM-DO-KHEN.

Some rules in the series of phosphorus-containing acids. Zhur. ob. khim. 26 no.8:2233-2237 Ag '56. (MLRA 10:11)

1. Kazanskiy khimiko-tekhnologicheskiy institut imeni S.M. Kirova. (Phosphorus acids)

Razumov A.

USSR / Organic Chemistry. Theoretical and General Problems of Organic Chemistry. E-1

Abs Jour : Ref Zhur - Khimiya, No 6, 1957, No 18988

Author : Razumov A., Sim-Do-Khen
Inst : Not given
Title : Some Regularities in the Series of Phosphorous Containing Acids.

Orig Pub : Zh. obshch. khimiyi, 1956, 26, No 8, 2233-2237

Abstract : Comparing the properties of organic and inorganic acids of phosphorus and by carrying out an analogy with the behaviour of HCOOH and its homologues, the authors propose to regard dialkylphosphinic acids R_2POOH as derivatives of H_3PO_2, but not of H_3PO_4. The anomalic high dissociation constant of acids H_3PO_3, H_3PO_2 and HCOOH, and the absence of chloranhydrides in the last two acids, the authors explain by the presence of energetically unstable linkage P - H and C - H, since H which is situated at the positive charged atom P or C, obtains a somewhat positive

Card : 1/2

Razumov, A.

USSR/Organic Chemistry. Synthetic Organic Chemistry. E-2

Abs Jour: Ref Zhur - Khimiya, No. 8, 1957, 26894.

Author : Razumov, A., Mukhacheva, O.
Inst :
Title : Research in Series of Derivatives of Alkylphosphinous and Dialkylphosphinous Acids. VI. Reactions of Addition and Isomerization of Esters of Alkylphosphinous Acids.

Orig Pub: Zh. obshch. khimii, 1956, 26, No. 9, 2463 - 2468.

Abstract: $RP(S)(OR')_2$ (II) or $RP(Se)(OR')_2$ (III) were prepared by addition of S or Se to $RP(OR')_2$ (I). They isomerize into $R_2P(O)OR$ at the action of RI on I ($R = R'$. R, R', yield in %, boiling point in °C/mm, $n^{20}D$ and d_4^{20} are enumerated:

Card 1/3

RAZUMOV, A.

A visit with our Bulgarian friends. Radio no.1:15 Ja '66.
(MIRA 19:1)

1. Starshiy trener TSentral'nogo radiokluba SSSR.

RAZUMOV, A., sud'ya respublikanskoy kategorii

Championships of combined sports competitions. Radio no.11:14-15 N '65. (MIRA 18:12)

RAZUMOV, Aleksandr Aleksandrovich; MURAKAYEVA, A., red.;
BAKHTIYAROV, A., tekhn. red.

[Home canning of fruits and vegetables] Konservirovanie
fruktov i ovoshchei v domashnikh usloviiakh. Tashkent,
Gos.izd-vo UzSSR, 1963. 229 p. (MIRA 17:1)
(Canning and preserving)

RAZUMOV, A.A.

Design of blast furnace hearth bottoms. Metallurg 8 no.4:12-14 Ap '63. (MIRA 16:3)

1. Karagandinskoye otdeleniye Gosudarstvennogo soyuznogo instituta po proyektirovaniyu metallurgicheskikh zavodov.
(Blast furances--Design and construction)

RAZUMOV, A.A.

Increase of the productive capacity at the canneries of Uzbekistan.
Kons.i ov.prom. 16 no.3:5-7 Mr '61. (MIRA 14:3)

1. Nauchno-tekhnicheskiy komitet Soveta Ministrov Uzbekskoy SSR.
(Uzbekistan—Canning industry)

Разумов, А А

USSR / General Topics. Methodology, History, Scientific Institutions and Conferences, Instruction, Bibliography and Scientific Documentation. A-1

Abs Jour : Ref Zhur - Khimiya, No 5, 1958, No 13417

Author : A.A. Razumov

Inst : -

Title : Fruit Treating Industry of Uzbekistan

Orig Pub : Konservn. i ovoshchesush. prom-st', 1957, No 10, 29 - 31.

Abstract : To the 40th Anniversary of the Great October socialist revolution.

Card : 1/1

On Air Cooling of Blast Furnaces SOV/133-59-4-4/32

1 table, 1 figure and 2 Soviet references.

ASSOCIATION: Sibirskiy Gipromez (Siberian Gipromez)

Card 2/2

[illegible]

RAZUMOV, A.A.

Processing industry of Uzbekistan. Kons. i ov. prom. 12 no.10:29-31
O '57. (MIRA 11:1)

1. Nauchno-tekhnicheskiy komitet Soveta Ministrov Uzbekskoy SSR.
(Uzbekistan--Fruit--Preservation)

RAZUMOV, A.A.

Mechanization and introduction of progressive equipment and technology in enterprises of the Uzbekistan canning industry. Kons. i ov. prom. 14 no.10:12-15 0 '59. (MIRA 12:12)

1.Nauchno-tekhnicheskiy komitet Soveta Ministrov Uzbekskoy SSR.
(Uzbekistan--Canning industry)

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

RAZUMOV, A-I.

Tautomeric conversions of some phosphoörganic compounds. A. E. Arbuzov and A. I. Razumov. *J. Gen. Chem.* (U. S. S. R.) 4, 834-41(1934); cf. A. and Arbuzova, *C. A.* 25, 2414, 3018.—Previously it was shown (*C. A.* 23, 4441) that in the synthesis of the higher homologs of carboxy phosphinic compds. from the Na compd. of $(R'O)_2P(:O)CH_2COR''$ (I) $^1/_2$ of the initial materials reacts normally: $(R'O)_2P(:O)CH(Na)CO_2R''$ + $R'''Hal$ → $(R'O)_2P(:O)CHR'''CO_2R''$ + NaHal (1), while the other half gives the acid ester and alkyl halide. This could be explained only by the existence of a tautomeric form of the Na compd. of I, since the $(EtO)_2$-PONa from which I is obtained, is known in 2 tautomeric forms (Strecker and Spitaler, *C. A.* 21, 1932; Stelling, *C. A.* 19, 3424). Hence, besides the normal reaction (1), one of the following reactions may be assumed: $(R'O)_2$-$P(ONa):CHCO_2R''$ + $R'''Hal$ → $(R'O)_2PHal(ONa)$-$CHR'''CO_2R''$ → $R'OP(:O)(ONa)CHR'''CO_2R''$ + $R'Hal$ (2); $(R'O)_2P(:O)CH:C(OR'')ONa$ + $R'''Hal$ → $(R'O)_2P(:O)CHR'''CHal(OR'')ONa$ → $(R'O)_2P$-$(:O)CHR'''C(:O)ONa$ + $R''Hal$ (3). A check could be made by using an ester with 2 different alkyl radicals. Na compd. of $(iso\text{-}BuO)_2P(:O)CH_2CO_2Et$, b_{14} 170-1°, d_4^{17} 1.0212 (cf. *loc. cit.*, A. and Dunin, *C. A.* 8, 2551, 21, 1627) with MeI produced 50% $(iso\text{-}BuO)_2P(:O)$-$CHMeCO_2Et$, b_{14} 165-8.5°, and 50% NaI (scheme 1), and 50% of the acid ester and unexpectedly a mixt. of MeI and iso-BuI. Thus, the reaction is highly complicated, which can be explained by tautomerism of the Na compd. of I, or by a simple exchange of the radicals, or both. Thus, the process shows a great similarity to the enol-ketonic tautomerism of the Na compd. of CH_2-$(CN)CO_2H$ conditioned by the tautomeric grouping, and makes clear the entire course of the reaction between the Na compd. of I and alkyl halides according to the 1st, 2nd and 3rd schemes. It was of interest to study the formation of keto esters, which could be analogously obtained by the interaction of $(EtO)_2PONa$ and halogen-substituted ketones. Nylen (*Studien über organische Phosphorverbindungen.* *Diss. Upsala* 1930, 43, 50-60) failed to obtain the normal compd. in the reaction: $(EtO)_2$-PONa + $BrCH_2COPh$ → $(EtO)_2P(:O)CH_2COPh$ + NaBr. The authors obtained this compd. by this and the following reaction: $P(OEt)_3$ + $BrCH_2COPh$ → EtBr + $(EtO)_2P(:O)CH_2COPh$, b_{14} 174-6°, d_0^{20} 1.1704. This, converted into the Na compd. and then treated with MeI, gave a small yield of probably $(EtO)_2P(:O)CH$-$MeCOPh$, b_{15} 171-80°. Ph_2PCl with iso-BuONa gave a good yield of Ph_2POBu, b_{16} 188°, d_4^{17} 1.0311. This with $AcCH_2Cl$ gave $Ph_2P(:O)CH_2Ac$, m. 73°; it gives no Na compd.

Chas. Blanc

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

RAZUMOV, A.I.

PROCESSES AND PROPERTIES INDEX

Propyl esters of pyrophosphorous, hypophosphoric and pyrophosphoric acids and the chloride of dipropylphosphorous acid. A. E. Arbuzov and A. I. Razumov. *J. Gen. Chem.* (U. S. S. R.) 7, 1762-5(1937).—Na di-Pr phosphite (I) reacts with Br_2 in ligroin to give a mixt. from which by repeated fractionations the following esters can be sepd.: tetra-Pr pyrophosphate, b_4 178.0-9.5°, d_0^0 1.1211, n_D^{20} 1.4300; *tetra-Pr hypophosphate*, $b_{1.5}$ 167-70°, d_0^0 1.1171, n_D^{20} 1.4278, which unites with Br_2 and gives cryst. compds. with the naphthols; and small amts. of *tetra-Pr pyrophosphite* (II) b_6 147.5-9.0°, d_0^0 1.0061, n_D^{20} 1.4408. II reacts with Br_2 and S and is easily hydrolyzed by H_2O to $(PrO)_2POH$. PrOH and PCl_3 give $PrOPCl_2$ b_{10} 40°, which with PrONa in dry Et_2O gives $(PrO)_2PCl$, b_5 65.5-6.5°, d_0^0 1.0620, n_D^{20} 1.4420. This compd. reacts with I to give 68.5% of II. H. M. L.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

RAZUMOV, A.I.

Ca

10

Preparation of diphenylamide of phosphonoacetic acid. A. I. Razumov and N. P. Kashurina. *Trans. Kirov Inst. Chem. Tech. Kazan* No. 8, 45-7(1940).—A mixt. of $P(OEt)_3$ and $ClCH_2CONPh_2$ was heated in a sealed glass tube at 150°, yielding 43% of the *diphenylamide of phosphonoacetic acid di-Et ester*, $(EtO)_2P(:O)CH_2CONPh_2$, m. 67-8°.

A. A. Podgorny

COMMON ELEMENTS

COMMON VARIABLES INDEX

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

MATERIALS INDEX

AUTHOR INDEX

RAZUMOV, A. I.

Ca

10

PROCESSES AND PROPERTIES INDEX

Mono- and dialkoxychlorophosphines. A. I. Razumov. *J. Gen. Chem.* (U.S.S.R.) 14, 464-71(1944)(English summary).—A no. of alkoxychlorophosphines were prepd. as follows: PCl_3 (162 g.) was treated slowly with 120 g. hexyl alc. with ice-cooling and stirring in a stream of CO_2, to yield 59% $C_6H_{13}OPCl_2$, b_{14} 104°, d_4^{0} 1.1371, n_D^{20} 1.4600. Similarly, 174.0 g. heptyl alc. and 206.5 g. PCl_3 gave 47% $C_7H_{15}OPCl_2$, $b_{12.5}$ 107°, d_4^{0} 1.1138, n_D^{20} 1.4720; while 206 g. PCl_3 and 195 g. octyl alc. gave 46% $C_8H_{17}OPCl_2$, b_{12} 123-4°, d_4^{0} 1.0919, n_D^{20} 1.4682. Attempted reaction between PCl_3 and $PhCH_2OH$ conducted as above always resulted in explosions when the distn. of the product, $PhCH_2OPCl_2$, was in progress; however, a small amt. of product salvaged b_{11-12} 113-14°, d_4^{0} 1.3213, $n_D^{20.4}$ 1.5584; it slowly decomps. even in a sealed ampoule. $EtOPCl_2$ (206.5 g.) in Et_2O was treated with cooling and stirring with 131 g. BuONa, followed by heating for 1 hr. to give 90% $EtO(BuO)PCl$, b_9 72-5°. Similarly, $PrOPCl_2$ and BuONa gave $PrO(BuO)PCl$, b_9 85-6°, d_4^{0} 1.1212, n_D^{20} 1.4421, as well as some $BuOPCl_2$. NaOEt and $C_7H_{15}OPCl_2$ gave $EtO(C_7H_{15}O)PCl$, b_{11} 123.5-24°, d_4^{0} 1.0249, $n_D^{20.5}$ 1.4408. Impure $MeO(BuO)PCl$, b_{11} 62-72°, was obtained from MeONa and $BuOPCl_2$. $NaOC_6H_{13}$ and $C_6H_{13}OPCl_2$ gave a product which decompd. on distn. PrOH (30 g.) and 79 g. pyridine in dry Et_2O were treated, with cooling, stirring and in CO_2 stream, with 80.5 g. $PrOPCl_2$ to give 54% $(PrO)_2PCl$, b_8 65-5.5°.

G. M. Kosolapoff

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

RAZUMOV, A. I.

a

19

Certain esters of phenylphosphonous and phosphinic acids. A. E. Arbuzov and A. I. Razumov (Org. Chem Lab., Chem Tech. Inst., Kazan). *Bull. acad. sci. U.R.S.S., Classe sci. chim.* 1945, 167-9. —The esters were prepd. by direct action of $PhPCl_2$ on the appropriate alc. in dry ether and in the presence of $PhNMe_2$. MeOH (33.0 g.), 90 g. $PhPCl_2$, and 90 g. $PhNMe_2$ in dry ether gave 60 g. (70.5%) of *Me ester* (I) *of phenylphosphonous acid*, b$_{15}$ 94.5°, d_4^0 1.0072, d_4^{20} 1.0732, n_D^{20} 1.5180. Some Me ester (II), b$_{11}$ 137.2-8.2°, of methylphenylphosphinic acid (isomerized product) was also obtained. From 19 g. of pure I in a 100-cc. flask with 1 cc. of MeI was obtained 17.5 g. of the isomerized ester (92.5%), b$_{11}$ 141.75°, d_4^0 1.1609, d_4^{20} 1.1436, n_D^{20} = 1.4808, n_D^{20} 1.5220. PrOH (82 g.), 122.0 g. $PhPCl_2$, and 146.0 g. $PhNMe_2$, after fractional distn., gave the *Pr ester* (III) *of phenylphosphonous acid*, b$_{15}$ 137°; yield 75%. No isomerized ester was found. The III is a colorless liquid, sol. in most org. solvents, d_4^0 1.0123, d_4^{20} 0.9925, n_D^{20} 1.4930. III (55 g.) and an equimol. amt. of PrI, heated for 2-3 hrs. at 80-90° and then subjected to fractional distn., gave 45 g. *Pr ester* (IV) *of phenylpropylphosphinic acid* (90%), b$_{14}$ 163°, d_4^0 1.0501, d_4^{20} 1.0463, n_D^{20} = 1.4970, colorless liquid with a pleasant odor. Et ester (VI) of phenylphosphonous acid (40 g.) (prepared like III) and 21.7 g. of $EtOCH_2CH_2Cl$ heated at 80-85° for about 1 hr. gave 40 g. (84%) *Et ester* (V) *of phenyl(ethoxyethyl)phosphinic acid*, b$_1$ 149.5°, d_4^0 1.1017, d_4^{20} 1.0811, n_D^{20} 1.4910, colorless liquid, having an odor of rose. VI (30.0 g.) and 16 g. of $MeOCH_2Cl$ were heated to 70° to start the reaction, and, after completion of the reaction, heated 45 min. at 120° and then subjected to fractional distn. to give *Et ester of phenyl(methoxymethyl)phosphinic acid*, b$_1$ 138.9°, d_4^0 1.1543, n_D^{20} = 1.4891, colorless liquid with a pleasant odor.

G. Lebedeff

A S M - S L A METALLURGICA

RAZUMOV, A. I. and PETROV, N.

"Synthesis of Phosphonoacetone and Some of Its Properties," Trudy Kazansk Khim. Tekh. Inst. im. S. M. Kirov, No.10, pp. 35-8, 1946

Evaluation B 3,075,646 Translation in Library

RAZUMOV, A.I.; BANKOVSKAYA, N.N.

Derivatives of phosphinic and phosphinous acids. Part 25: Rate of decomposition of the aliphatic intermediate products of Arbuzov rearrangement. Zhur. ob. khim. 34 no.10:3243-3247 O '64. (MIRA 17:11)

1. Kazanskiy khimiko-tekhnologicheskiy institut im. S.M. Kirova.

[illegible]

Reaction of dialkylphosphorous acids with orthoformic esters.
Zhur. ob. khim. 34 no.9:3125-3126 S '64.
(MIRA 17:11)

1. Kazanskiy khimiko-tekhnologicheskiy institut imeni S.M. Kirova.

RAZUMOV, A. I.

PA 7572

USSR/Academy of Sciences
Biography

Jan/Feb 1948

"Scientific Method of A. Ye. Arbuzov," A. I. Razumov, Kazan, 14 pp

"Uspekhi Khimii" Vol XVII, No 1

Gives biographical sketch of Arbuzov in honor of his 45th year of scientific work. Lists 60 articles and books written by Arbuzov.

[redacted]

7572

RAZUMOV, A. I., and ARBUZOV, A. E.

"Some Esters of Allylphosphonic Acid," Trudy Kazansk Khim, Tekh, Inst. im. S.m. Kirov, No. 15, pp 3-6, 1950.

Evaluation B 3,075,646 Translation in Library

RAZUMOV, A.I.; KUKHTIN, V., student; SAZONOVA, N.

Reactions of certain phosphorus halogen compounds with esters of glycolic acid. Trudy KKHTI no.15:7-14 '50. [pub. '51] (MIRA 12:12)
(Phosphorus compounds) (Glycolic acid)

CA RAZUMOV, A.I.

10

Some esters of allylphosphonic acid. A. E. Arbuzov and A. I. Razumov (Kazan Chem.-Technol. Inst.). *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk* 1951, 714-16.—Heating 30 g. $CH_2:CHCH_2Cl$ (I) with 65 g. $(EtO)_3P$ in sealed tubes 4 hrs. to 150° gave a mixt. of $EtPO(OEt)_2$ and $CH_2:CHCH_2PO(OEt)_2$, b_{14} 83-100°. Similarly 13 g. $(EtO)_3P$ and 60 g. I gave 53% $CH_2:CHCH_2PO(OEt)_2$. Heating 65 g. $(EtO)_3P$ with 47.5 g. $CH_2:CHCH_2Br$ (II) 4 hrs. to 70-80° in a sealed tube gave an unstated amt. of $EtPO(OEt)_2$ and 70% $CH_2:CHCH_2PO(OEt)_2$, b_{11} 96.5-7.0°, d_0^0 1.0556, d_0^{17} 1.0362, n_D^{17} 1.4295. Heating 35 g. $(MeO)_3P$ with 60-8 g. II 3 hrs. to 60-5° in a sealed tube gave 40 g. unreacted bromide, 5 g. $MePO(OMe)_2$, and 10 g. (25%) $CH_2:CHCH_2PO(OMe)_2$. Refluxing 35 g. $(MeO)_3P$ with 100 g. II 5 hrs. at 76-8° gave 21 g. MeBr, 55 g. unreacted bromide, and 32 g. $CH_2:CHCH_2PO(OMe)_2$ (76%), b_{14} 90-2°, d_0^0 1.1378, d_0^{20} 1.1160, n_D^{20} 1.4320. Treatment of 44 g. $(MeO)_2POH$ and 9.2 g. Na in 176 ml. dry MeOH with 48.4 g. II, followed by heating, gave only 10-12 g. NaBr, as well as 10 g. distillable product, contg. some 3 g. $MePO(OMe)_2$ and 3 g. $CH_2:CHCH_2PO(OMe)_2$; much undistillable residue remained. Heating 50 g. $(iso\text{-}PrO)_3P$ with 50 g. II in a sealed tube 4 hrs. at 150° gave 38 g. (65%) $CH_2:CHCH_2PO(OCHMe_2)_2$, b_{14} 64-5° (?), d_0^0 0.9985, $d_0^{17.5}$ 0.9828, $n_D^{17.5}$ 1.4277. G. M. Kosolapoff

RAZUMOV, A. I.

Chemical Abst.
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Organic Chemistry

5

(3)

Some esters of alkanethiophosphonic, alkaneselenophosphonic, dialkylphosphinic, and alkanephosphonous acids and the mechanism of addition reactions to these esters. A. I. Razumov, O. A. Mukhacheva, and Sim-Do-Khen. *Bull. acad. sci. U.S.S.R., Classe sci. chim.* 1952, 797-802(Engl. translation). See *C.A.* 47, 10466*c*. H. L. H.

9-28-54

RAZUMOV, A.I.; MUKHACHEVA, O.A.; SIM-DO-KHEN.

Some esters of alkanethiophosphonic, alkaneselenophosphonic, dialkylphosphinic, and alkanephosphonous acids and the mechanism of addition reactions of these esters. Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk '52, 894-901. (MLRA 5:11)
(CA 47 no.20:10466 '53)

1. S.M.Kirov Chem.-Technol. Inst., Kazan.

1. RAZUMOV, A. I., MUKHACHEVA, O. A., KHEN, Sim-Do-

2. USSR (600)

4. Phosphonic Acid

7. Esters of alkylthiophosphonic, alkylselenophosphonic, dialkylphosphonic, and alkylphosphinic acids, and their mechanism of addition to the latter. Izv. AN SSSR. Otd. khim. nauk, No. 5, 1952

9. Monthly List of Russian Accessions, Library of Congress, February 1953. Unclassified.

RAZUMOV, A.I.

3

Esters of alkylphosphonous acids and some of their properties. A. I. Razumov, O. A. Mukhacheva, and Sim-Do-Khen. *Trudy Kazan. Khim.-Tekhnol. Inst. im. S. M. Kirova* 1952, No. 17. 151-62.—Cadmium-org. synthesis (cf. Fox, *C.A.* 45, 2854*a*) with 18.22 g. Mg, 110 g. CdI_2, 113 g. iso-BuBr, and 130 g. PCl_3 gave 26% *iso-BuPCl*$_2$, b_{11} 48.5-9.0°, d_0^{20} 1.172, n_D^{20} 1.4719. This (30 g.) added slowly to 28 g. iso-BuOH and 30 g. pyridine in dry Et_2O gave 85% *iso-BuP(OCH*$_2$*CHMe*$_2$*)*$_2$ (I), $b_{12.4}$ 105.5-7.5°, d_0^{20} 0.8677, n_D^{20} 1.4290, which readily added Br in the cold; treatment of the ester with Cu_2Br_2 gave a sirupy adduct with evolution of heat. The ester treated with S in C_6H_6 gave a vigorous reaction and yielded 100% *iso-BuP(S)(OCH*$_2$- *CHMe*$_2$*)*$_2$, b_{12} 135-6.5°, d_0^0 0.9865, d_0^{20} 0.9636, n_D^{20} 1.4480, which hydrolyzed with hot concd. HCl to a waxy solid. I reacted readily with Se, and after 1 hr. on a steam bath yielded over 90% *iso-BuP(Se)(OCH*$_2$*CHMe*$_2$*)*$_2$, b_{14} 144-6°, d_0^{20} 1.034, n_D^{20} 1.4571. Heating 12 g. I and 9 g. iso-BuI in sealed tube 3 hrs. at 100° gave 80% *(iso-Bu)*$_2$*P(O)(OCH*$_2$- *CHMe*$_2$*)*, b_3 99-102°, d_0^{21} 0.9151, n_D^{21} 1.4311, which hydrolyzed with concd. HCl in 3 hrs. at 150-60° to a waxy acid. Reaction of PCl_3 with Et_4Pb gave *EtPCl*$_2$, b. 112-13°, d_0^{20} 1.2563, n_D^{20} 1.4938. This with EtOH and pyridine in Et_2O gave 60% *EtP(OEt)*$_2$ (II), b. 137-9°, d_4^{20} 0.9084, n_D^{20} 1.4222, which readily oxidized in air and added Br; with Cu_2Br_2 it yielded a cryst. adduct. Treatment of the ester with S in CO_2 atm. in dry C_6H_6 below 60° gave 80% *EtP(S)(OEt)*$_2$, b_{12} 86.5-7°, d_0^{20} 1.0349, n_D^{20} 1.4617, which hydrolyzed with HCl to a waxy acid. The reaction of 15 g. II with 15.5 g. EtI in sealed tube at 70° gave in 3 hrs. 64.5% *Et*$_2$*P(O)OEt*, b_{14} 91-2°, d_0^{20} 0.9964, n_D^{20} 1.4301.

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RAZUMOV, A.I.; MUKHACHEVA, O.A. ...

Addn. of 5.5 g. S at once to 22 g. $EtPCl_2$ under CO_2 or N_2 followed by heating to 112°, and brief cooling and further addn. of 0.6 g. $AlCl_3$ and 0.2 g. S, caused a vigorous reaction (temp. rise to 150° and after heating 2 hrs., finally to 172°) and gave 80% *$EtPSCl_2$*, $b_{11.5}$ 82.5°, d_0^{20} 1.3550, n_D^{20} 1.5413, which did not react with water at room temp., while with EtOH and pyridine in xylene or, better, with EtONa in EtOH it gave $EtP(S)(OEt)_2$ identical with the above specimen. Reaction of 15 g. II with 7.9 g. Se was spontaneous and yielded 75% *$EtP(Se)(OEt)_2$*, $b_{11.5}$ 97.5°, d_0^{20} 1.2743, n_D^{20} 1.4872. Cd-org. synthesis gave, similarly, 40% *$BuPCl_2$*, b. 156-7°, d_0^{20} 1.1653, n_D^{20} 1.4858. G. M. K.

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RAZUMOV, A: KUKHTIN .: SAZONOVA, N.

Phosphorus Halides

Reactions of some halogen compounds of phosphorus with glycolic acid esters. Zhur. ob khim. 22 No. 2, 1952.

Monthly List of Russian Accessions. Library of Congress, November 1952 Unclassified.

RAZUMOV, A. I.

Card 1 of 2

USSR/Chemistry - Organo-Phosphorus Compounds Jun 52

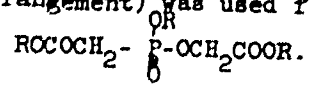
"The Reaction Between Some Phosphorus Halides and Esters of Glycolic Acid," A. Razumov, V. Kukhtin, N. Sazonova, Org Chem Lab, Kazan' Chem-Technol Inst

"Zhur Obshch Khim" Vol XXII, No 6, pp 920-926

Studied the reaction of esters of glycolic acid with PCl_3, ethoxydichlorophosphine and dipropoxychlorophosphine. With PCl_3, instead of the normal phosphite with trivalent phosphorus p $P(OCH_2COOC_2H_5)_3$, its isomer with pentavalent P is obtained. Explains this phenomenon. Gives 2 methods for

218T15

USSR/Chemistry - Organo-Phosphorus Compounds (Contd 1) Jun 52

synthesis of dipropyl-(carboproxy-methyl) phosphorous ester. The latter is partially regrouped into a compd with pentavalent P. Regrouping of this compd was also carried out by means of the ester of chloroacetic acid, and the process (an Arenzov rearrangement) was used for the synthesis of the compd  $ROCOCH_2-\overset{OR}{\underset{O}{P}}-OCH_2COOR$. This synthesis shows the structure of the ester which was obtained as a secondary product in the synthesis of dipropyl carbopropoxy methyl phosphorous ester.

218T15

RAZUMOV, A. I., MUKHACHEVA, O. A., SIM-DO-KHEN

"Esters of Alkylphosphonic Acids and Some of Their Properties," Tr Kazansk. Khim.-Technol. In-ta, No 17, pp 151-162, 1953

Four esters of alkylphosphonic acids were prepared by treating equimolecular quantities of alkyldichlorophosphine with the appropriate alcohol in the presence of pyridine. The esters readily underwent addition Arbuzov's rearrangement, also. The esters were saponified to the corresponding acids. (RZhKhim, No 20, 1954)

SO: Sum, No 606, 5 Aug 55

[illegible], [illegible].

Phosphorus organic compounds and their present-day [illegible]: to the 80th anniversary of the birth of Academician A.E. Arbuzov. [illegible] no.18:[illegible] [illegible] '57].
(MIRA [illegible])
(Phosphorus organic compounds)
(Arbuzov, Aleksandr Erminingel'dovich, 1877-)

RAZUMOV, A.I.

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Chem

Alkyl esters of diethylphosphinic acid. II. A. I. Razumov and O. A. Mukhacheva. *Trudy Kazan. Khim.-Tekhnol. Inst. im. S.M. Kirova* 1953, No. 18, 42–7; cf. *C.A.* 47, 10460c.—Addn. of 20 g. Et_2POCl to an ice-cooled mixt. of 4.5 g. MeOH, 11.2 g. pyridine, and 6 vols. Et_2O followed by stirring 1 hr. at room temp. and 1 hr. at reflux gave after removal of amine salts 65% $Et_2PO(OMe)$, b_{15} 86–6.2°, d_4^{20} 1.0261, n_D^{20} 1.4393. Similarly were prepd. (d_4^{20} and n_D^{20} given): 50% $Et_2PO(OPr)$, b_{15} 103–4°, 0.9916, 1.4356; 50% $Et_2PO(OCHMe_2)$, b_{14} 93.5°, 0.9066, 1.4337; 63% $Et_2PO(OBu)$, b_{15} 116°, 0.9596, 1.4375; 79% $Et_2PO(OCH_2CHMe_2)$, b_{11} 112°, 0.9530, 1.4355; 49% $Et_2PO(OC_6H_{13})$, b_{11} 141–2.5°, 0.9431, 1.4420; 68% $Et_2PO(OC_7H_{15})$, b_4 129–30°, 0.9364, 1.4440; 76% $Et_2PO(OC_8H_{17})$, $b_{1.5}$ 128–9°, 0.9306, 1.4460. All the above esters are sol. in org. solvents and in H_2O. Isomerization of Et_2POEt gave 65% $Et_2PO(OEt)$, b_{14} 91–2°, 0.9964, 1.4337.

G. M. Kosolapoff

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Razumov, A.I.

Simplest esters of diethylphosphinic acid. A. I. Razumov and O. A. Mukhacheva (S. M. Kirov Chem. [illegible] Kazan). *Doklady Akad. Nauk S.S.S.R.* 91, 271-2([illegible]); *C.A.* 40, 3411⁴; 47, 10466*c*.—Isomerization of $EtP(OEt)_2$ gave 65% $Et_2P(O)OEt$, b_{14} 91-2°, d_4^{20} 0.9904, n_D^{20} 1.4337, converted to $Et_2P(O)Cl$ which with RONa or ROH gave the following esters, $Et_2P(O)OR$ (*R*, % yield, b.p./mm., d_4^{20}, and n_D^{20} shown): *Me*, 65, 86°/12, 1.0261, 1.4392; *Pr*, 50, 103-4°/13, 0.9916, 1.4356; *iso-Pr*, 50, 93.5°/14, 0.99[illegible], 1.4337; *Bu*, 63/115°, 12, 0.9600, 1.4375; *iso-Bu*, 70, 11[illegible]/13, 0.9530, 1.4355; C_5H_{11}, 49, 141-2.5°/13, 0.9431, [illegible]; C_7H_{15}, 68, 129-30°/4, 0.9304, 1.4440; and C_6H_{11}, 76, 125-6°/1.25, 0.9306, 1.4455. The esters are sol. in H_2O, EtOH, and Et_2O. It is stated that these are the 1st examples of esters of dialkylphosphinic acids; however, cf. Watson and Kosolapoff, *C.A.* 46, 1962*ah*. G. M. Kosolapoff

RAZUMOV, A. I.

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Isopropyl ester of isopropylphosphonous acid and some of its properties. A. I. Razumov and Sim-Do-Khen. *Trudy Kazan. Khim.-Tekhnol. Inst. im. S. M. Kirova* 1954-1955, No. 19-20, 167-9.—Cd-org. method (cf. Fox, *C.A.* 45, 2854*a*) was employed to prep. *iso-PrPCl*$_2$, b_{17} 41-2°, d_0^{20} 1.2775. Addn. of this under N or CO$_2$ to iso-PrOH and pyridine (amts. unstated) in Et$_2$O yielded, after sepn. of pyridine-HCl, *iso-PrP(OCHMe*$_2$*)*$_2$, b_{14} 59.5-60.5°, d_0^{20} 0.8794, n_D^{20} 1.4150, a colorless liquid which was rapidly oxidized by O. The ester in C$_6$H$_6$ reacted exothermically with S yielding nearly 100% *iso-PrP(S)(OCHMe*$_2$*)*$_2$, b_{10} 81-2°, d_0^{20} 0.9841, n_D^{20} 1.4422. The latter heated in sealed tube with 1:1 HCl 5 hrs. at 200° gave much H$_2$S and an unidentified mercaptan, with some unreacted ester, indicating a much greater stability to hydrolysis among thiophosphonates than in phosphonates. G. M. Kosolapoff

2

Chem

RAZUMOV, A. I.

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✓ Biologically active alkylated amide esters and mixed esters of alkylphosphonic acids. A. I. Razumov, E. A. Markovich, and O. A. Mukhacheva (S. M. Kirov Chem. Technol. Inst., Kazan). *Khim. i Primenenie Fosfororgan. Soedinenii, Akad. Nauk S.S.S.R., Trudy 1-oi Konferentsii,* 1955, 194-201(Pub. 1957).—The following substances were prepd. during 1945-50 in a search for biologically active compds. of P which would not have the defects of fluorophosphates. Addn. of PCl_5 to $RPO(OR)_2$ gives 10-30% $RPOCl_2$ and up to 40% $RPOCl(OR)$, but the products have close b.ps. and sepn. is difficult. $SOCl_2$ also gave unsatisfactory results. Reaction of $RPOCl_2$ with $R_2NH.HCl$ is not very good; it requires 3 moles $RPOCl_2$ and gives no more than 30-40% desired $RP(O)(NR_2)Cl$. Reaction of 2 moles R_2NH with 1 mole $RPOCl_2$ however did yield: $MeP(O)NEt_2Cl$, b_3 115-5.5°, d_0^0 —, d_4^{20} 1.1275, n_D^{20} 1.4648; $EtP(O)NEt_2Cl$, $b_{1.4}$ 101.5°, 1.1140, 1.0965, 1.4643; $PrP(O)NEt_2Cl$,

1/5

RAZUMOV, A.I., MARKOVICH, E.A., MUKHACHEVA, O.A.

b_4 112.5–13.5°, 1.0860, 1.0707, 1.4642; iso-$PrP(O)NEt_2Cl$, b_1 90–1°, 1.0887, 1.0708, 1.4627; $BuP(O)NEt_2Cl$ b_1 118– 15° [illegible]

[illegible] ness of the P-N bond [illegible] the ester [illegible] anhydrides were prepd. by [illegible] the presence of bases. [illegible] treatment of $RP(O)(NR_2)Cl$ gave anhydrides, [illegible] $[EtP(O)OEt]_2O$ [illegible] 41°, [illegible] 1.0770, [illegible]

(Me)Cl, b [illegible] 80-73, 1.3171, 1.2924, 1.4346; 30% EtP [illegible] 75

RAZUMOV, E.A., MALKOVICH, E.A., MUKHACHEVA, O.A.

P(S)(OEt)Cl, $b_{15.4}$ 80-1°, 1.2230, 1.2023, 1.4935. The only complication met in the above group was the prepn. in pure state of EtP(O) [illegible] for synthesis of the [illegible] chloride, since EtP [illegible] is very close to [illegible] P-P(O)-

RAZUMOV, A.I., MARKOVICH, E.A., MUKHACHEVA, O.A.

4E4j

1.4303; $EtP(O)(OEt)\overline{N.CH_2.CH_2}$, $b_{1.5}$ 89-92°, 1.0930, 1.0752, 1.4486; $EtP(O)(OEt)NHCH_2CH_2Cl$, $b_{0.75}$ 144-5°, 1.1693, 1.1515, 1.4565; $EtP(O)(OEt)NHCHMe(CH_2)_3NEt_2$, $b_{0.25}$ 153-4°, 0.9733, 0.9594, 1.4530; $EtP(O)(SEt)NEt_2$, b_2 103-8°, 1.0455, 1.0297, 1.4892; $EtP(O)(NEt_2)OC_6H_4NO_2\text{-}p$, $b_{0.2}$ 172.5°, 1.2019, 1.1861, 1.5309; $MeP(O)(OMe)NEt_2$, $b_{0.5}$ 71-4°, 1.0387, 1.0264, 1.4355; $MeP(O)(OEt)NEt_2$, $b_{1.4}$ 77-9°, 1.0127, 0.9944, 1.4350; $MeP(O)(OCHMe_2)NEt_2$, $b_{0.1}$ 80-1°, 1.0901, 1.0763, 1.4395; $iso\text{-}PrP(O)(OEt)NEt_2$, $b_{0.4}$ 74.5-5°, 0.9866, 0.9709, 1.4360. All these were biologically active inhibitors of cholinesterase and miotics. Insecticidal and other biological properties were not examined. Miosis lasting up to 50 days was produced by them in cats. Stability of aq. solns. ranged from 10 to 50 days. The most active miotics were: $EtP(O)(OCHMe_2)NEt_2$ (0.15% aq. soln.; 50% cholinesterase inhibition by $6 \times 10^{-8}M$ concn.) and $EtP(O)(OEt)NHEt$ (0.1%; $1 \times 10^{-8}M$). The ester chlorides also gave the mixed esters: $EtP(O)(OMe)OC_6H_4NO_2\text{-}p$, $b_{0.11}$ 159-60°, —, 1.3018, 1.5294; $EtP(O)(OEt)OC_6H_4NO_2\text{-}p$, $b_{0.1}$ 163-5°, 1.2716, 1.2545, 1.5242; $EtP(O)(OEt)OC_6H_4NO_2\text{-}o$, $b_{0.15}$ 140-2°, 1.2666, 1.2487, 1.5115; $EtP(O)(OEt)OC_6H_4NO_2\text{-}m$, $b_{0.15}$ 145-9°, 1.2665, 1.2482, 1.5110; $EtP(O)(OPr)OC_6H_4NO_2\text{-}p$, b_2 158-8.5°, 1.2407, 1.2231, 1.5210; $EtP(O)(OCHMe_2)OC_6H_4NO_2\text{-}p$, $b_{0.14}$ 161-4°, —, 1.2286, 1.5233; $EtP(O)(OBu)OC_6H_4NO_2\text{-}p$, $b_{0.6}$ 181.5-2.5°, 1.2137, 1.1968, 1.5180; $EtP(O)(OCH_2CHMe_2)OC_6H_4NO_2\text{-}p$, $b_{0.5}$ 163.5-4°, 1.2139, 1.1971, 1.5174; $EtP(O)(OEt)OC_6H_4Cl\text{-}p$, $b_{0.17}$ 117-18°, 1.2298, 1.2122, 1.5050; $EtP(O)(OEt)OC_6H_4Cl\text{-}o$, $b_{0.06}$ 106-7°, 1.2250, 1.2065, 1.5045; EtP-[illegible] $(OEt)OC_6H_4NO_2\text{-}p$, m. 114°. These were more interesting and useful compds. than the ester amides, being stable and

RAZUMOV, A.I., MARKOVICH, E.A., MUKHACHEVA, O.A.

6

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highly active. Especially powerful anticholinesterase action was found in $EtP(O)(OEt)OC_6H_4NO_2$-p, which was named Armin; the substance shows mouse toxicity at 0.4-0.6 mg./kg. and shows anticholinesterase inhibition at 1×10^{-1} to 2×10^{-1} M concn. It is slightly sol. in H_2O and keeps in soln. for years; its solns. are readily sterilizable; in clinical practice it is used at 1:20,000-50,000 diln. and is very effective in glaucoma when other medicinals fail; it shows no side reactions in the patient; it is being examd. in myasthenia and infantile paralysis therapy. The other esters in the above group are similar in action, but are less potent. Also there were prepd. $(RO)_2PNR_2$ and $(RO)_2PNHR$ series. Attempts to effect the Arbuzov reaction with these gave very low yields of phosphonates, the reactions with RX yielding mainly the quaternary salts. The substances added S. Some of the P^{III} ester amides produced myosis, while the S adducts were insecticidal. G. M. Kosolapoff

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"Biologically Active Alkylated Acid Esters and Mixed Esters of Alkylphosphonic Acids"
Paper presented at the First Conference on Phosphorus Compounds, Kazan, 8-10 Dec 55

SO: B-[illegible],841

[illegible] et al.,

"Esters of Alkylphosphonous and Dialkylphosphinous Acids and Their Biological Activity"
Paper presented at the First Conference on Phosphorus Compounds, Kazan, 8-10 Dec 55

SO: [illegible]-3, [illegible], [illegible]

RAZUMOV, A.I.

Distr: 4E4j 7 4

Ethyl *p*-nitrophenyl ester of ethylphosphinic acid (Armine), its homologs and analogs. A. I. Razumov, E. A. Markovich, and O. A. Mukhacheva. U.S.S.R. 103,034, June 25, 1956. The title compds. are obtained by isomerization of phosphites in the presence of a small quantity of already isomerized phosphite followed by chlorination of the resulting product with PCl_5. The last step is carried out in a greatly dild. soln. in an inert solvent, such as CCl_4. Finally, the halide is exchanged for a *p*-nitrophenyl or other similar group. M. Hosch

USSR/ Organic Chemistry - Synthetic organic chemistry E-2

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11793

Author : Razumov A., Mukhachova O.

Title : Investigations of Derivatives of Alkyl Phosphinous and Dialkyl Phosphinic Acids. III. On Atomic Refraction of Phosphorus in Esters of Alkyl Phosphinous Acids.

Orig Pub : Zh. obshch. khimii, 1956, 26, No 5, 1436-1440

Abstract : Determined was a regularity in changes of atomic refraction of phosphorus on transition from alkyl esters if trivalent phosphorus to phophines. Each replacement of OR group by R causes an increase in atomic refraction of phosphorus by 0.7. Values of AR_D are given for the following types of compounds: $(RO)_3PO$ 3.75, $(RO)_2P(O)R$ 4.27, $ROP(O)R_2$ 4.79, $(RO)_3P$ 7.04, $(RO_2)PR'$ 7.74 (I), $ROPR_2$ 8.44, PR_3 9.14. Synthesized were the following I, from $R'PCl_2$ and alcohols in the presence of pyridine (listing the values of R', R, yield in %, BP in °C/mm, $n^{20}D$, d_4^{20}): $n\text{-}C_3H_7$, C_2H_5, 64, 52-53/12, 1.4275, 0.9029; $n\text{-}C_3H_7$, 74, 81-82/11,

Card 1/2

USSR/ Organic Chemistry - Synthetic organic chemistry E-2

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11793

1.4223, 0.8917; n-C_4H_9, C_2H_5, 64, 68.5-70/12, 1.4308, 0.8963; n-C_4H_9, n-C_3H_7, 60, 99.5-101/14, 1.4355, 0.8961; n-C_4H_9, n-C_4H_9, 64, 116.5-118/10, 1.4410, 0.8883.

Card 2/2

RAZUMOV, A. I.

Derivatives of alkylphosphonous and dialkylphosphinic acids. III. Atomic refraction of phosphorus in esters of alkylphosphonous acids. A. I. Razumov and O. A. Mukhacheva. *J. Gen. Chem. U.S.S.R.* 26, 1616-18(1956)(English translation).—See *C.A.* 50, 14325g. R. M. R.

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RAZUMOV, A.; MUKHACHEVA, O.

Research in the series of derivatives of alkylphosphinous and dialkylphosphinic acids. Part 4. Reactions of addition and isomerization of esters of alkylphosphinous acids. Zhur.ob.khim. 26 no.9:2463-2468 S '56. (MLRA 9:11)

1. Kazanskiy khimiko-tekhnologicheskiy institut imeni S.M. Kirova. (Phosphinous acid)

RAZUMOV, A. I.; MUKHACHEVA, O. A.; ZAYKONNIKOVA, I. V. (Kazan Chem. Tech. Inst. S. M. Kirov and Kazan Med. Inst.)

"Esters of Alkylphosphinous and Dialkylphosphinic Acids and Their Biological Activity" (Efiry alkilfosfinistykh i dialkilfosfinovykh kislot i ikh biologicheskaya aktivnost')

Chemistry and Uses of Organophosphorous Compounds
(Khimiya i primeneniye fosfororganicheskikh soyedneniy),
Trudy of First Conference, 8-10 December 1955, Kazan,
PP. 205-217 Published by Kazan Affil. AS USSR, 1957

Report discussed by N. N. Godovikov (Inst. Elem. Organ. Compounds AS USSR) and N. I. Rizpolozhenskiy (Chem. Inst. im. Acad. A. Ye. Arbuzov, Kazan Aff. AS USSR).

RAZUMOV, A. I.; MARKOVICH, Ye. A.; MUKHACHEVA, O. A. (Kazan Chem. Tech. Inst. im. S. M. Kirov)

"Biologically Active Alkylated Amido-Esters and Compound Esters of Alkylphosphinic Acids" (Biologicheski aktivnyye alkilirovannyye amido-efiry i smeshannyye efery alkilfosfinovykh kislot) (Work carried out 1945-1950)

Chemistry and Uses of Organophosphorous Compounds (Khimiya i primeneniye fosfororganicheskikh soyedneniy), Trudy of First Conference, 8-10 December 1955, Kazan, Pp. Published by Kazan Affil. AS USSR, 1957
194-204

RAZUMOV, A.I. (Kazan')

Biological activity and practical utilization of organic compounds of phosphorus. Usp.khim. 26 no.9:975-991 S '57. (MIRA 10:10)
(Phosphorus organic compounds)

RAZUMOV, A.I.

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Derivatives of alkylphosphonous and dialkylphosphinic acids. V. Esters and amides of dialkylphosphinic acids and their biological activity. A. I. Razumov, O. A. Mukhacheva, and I. V. Zaikonnikova (State Med. Inst., Kazan). Zhur. Obshchei Khim. 27, 754-7(1957); cf. C.A. 51, 1822g.—Treatment of $R_2P(O)OR$ with PCl_5 in CCl_4 5-6 parts with addn. of some 2/3 of the required amt. of PCl_5 at 27-30°, followed by heating to 60°, adding the remainder of PCl_5 at this temp., and heating until all PCl_5 had reacted gave: 70% Et_2POCl, b_{14} 108-9.5°, d_{20} 1.1304, n_D^{20} 1.4047; 80% Pr_2POCl, b_{11} 118.5-20°, 1.0692, 1.4638; 87% Bu_2POCl, b_{11} 142-4°, 1.0296, 1.4043. Reaction of PCl_5 with R_2PO_2H in C_6H_6 gave: 65% iso-Pr_2POCl, b_{15} 100-10.5°, 1.0800, 1.4607; 85% iso-Bu_2POCl, b_4 110-10.5°, 1.0216, 1.4595. These were converted to aryl esters as follows: either the phosphinyl chloride and the desired phenol were treated in Et_2O with appropriate amt. of Et_3N, or a dry metal phenoxide was added to Et_2O soln. of phosphinyl chloride; both variants were run in Et_2O at −10°. Thus were formed the following esters whose soly. in H_2O decreases progressively from 1:35 to 1:8000: 65% $Et_2P(O)OPh$, $b_{0.4}$ 132-3°, m. —, d_{20} 1.0941, n_D^{20} 1.5164; 68% o-$MeC_6H_4OP(O)Et_2$, $b_{0.5}$ 138.5-9.5°, —, 1.0778, 1.5161; 72% p-$MeC_6H_4OP(O)Et_2$, $b_{0.5}$ 154-5°, m. 53.5-4°, —, —; 85% o-$ClC_6H_4OP(O)Et_2$, $b_{0.12}$ 133°, —, 1.1809, 1.5242; 69% p-$ClC_6H_4OP(O)Et_2$, $b_{0.12}$ 134-5°, m. 35-8°, 1.1963, 1.5257; 64% o-$O_2NC_6H_4OP(O)Et_2$, $b_{0.4}$ 108-70°, —, 1.2312, 1.5324; 58% m-$O_2NC_6H_4OP(O)Et_2$, $b_{0.5}$ 171-1.5°, —, 1.2288, 1.5326; 60% p-$O_2NC_6H_4OP(O)Et_2$, $b_{0.15}$ 164.5-6°, —, 1.2350, 1.5432; 79% o-$O_2NC_6H_4OP(O)Pr_2$, $b_{0.12}$ 158.5-60°, —, 1.1697, 1.5224; 70% m-$O_2NC_6H_4OP(O)Pr_2$, $b_{0.15}$ 174-6°, —, 1.1710, 1.5256; 72% p-$O_2NC_6H_4OP(O)Pr_2$, $b_{0.25}$ 184-7°, —, 1.1816, 1.5360; 80% p-$O_2NC_6H_4OP(O)(CHMe_2)_2$, —, m. 78.5-9.5°, —, —; 72% o-$O_2NC_6H_4OP(O)Bu_2$, $b_{0.15}$ 184-6°, —, 1.1250, 1.5151; 70% m-$O_2NC_6H_4OP(O)Bu_2$, $b_{0.1}$ 190-1°, —, 1.1253, 1.5168; 60% p-$O_2NC_6H_4OP(O)Bu_2$, $b_{0.25}$ 205-6°, —, 1.1320, 1.5204; 67% p-$O_2NC_6H_4OP(O)(CH_2CHMe_2)_2$, $b_{0.15}$ 176.5-7°, m. 41-3°, —, —. Reaction of 1:2 molar ratios of appropriate

1/2

RAZUMOV, A.I., MUKHACHEVA, O.A., ZAIKONNIKOVA, I.V.

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chlorides with amines in Et_2O at −10° gave the following amides which were sol. in H_2O and EtOH, with monoalkylamides being insol. in Et_2O in contrast to the soluble dialkylamides, the mol. wts. of the monoalkylamides being found to correspond to dimeric mols.: *$Et_2P(O)NHEt$*, 50%, $b_{0.4}$ 120.5-2°, 0.9590, 1.4603; *$Et_2P(O)NEt_2$*, 50%, b_{1} 154-5°, 0.9403, 1.4584; *$Pr_2P(O)NEt_2$*, 60%, $b_{0.25}$ 104°, 0.9287, 1.4560; *$Bu_2P(O)NHEt$*, 55%, $b_{2.5}$ 157-8°, 0.9363, 1.4593; *$Bu_2P(O)NEt_2$*, 70%, $b_{0.2}$ 126-7°, 0.9173, 1.4581. All the aryl esters were biologically active, being more active than the esters of diphenylphosphinic acid (cf. Freedman, *et al.*, *C.A.* 48, 3917*e*). some were very powerful inhibitors of cholinesterase with low toxicity; many caused myosis and reduction of intraocular pressure. The appreciable aq. soly. of the aryl esters and their stability in soln. is of interest for biol. uses. The following values for the aryl esters listed above (in order) are given: (L.D.$_{50}$ for white mice intravenously and subcutaneously, presence of myosis in rabbit (+ or −), and minimal concn. for anticholinesterase activity as tested by frog gastric muscle strip or colorimetrically): 1, 137 mg./kg., not tested, −, 5×10^{-4}, 2×10^{-4}; 2, 75, not tested, −, 5×10^{-4}, 2×10^{-4}; 3, 155, not tested, −, 5×10^{-4}, 2×10^{-4}; 4, 90, not tested, [illegible] 2×10^{-4}; 5, 110, not tested, −, 4×10^{-4}, 4×10^{-4}; 6, [illegible], 60, +, 1×10^{-4}, 1×10^{-4}; 7, 19, 22.5, +, 2×10^{-5}, [illegible] 10^{-4}; 8, 3.4, 4, +, 1×10^{-4}, 2×10^{-4}; 9, 8, 17.5, [illegible] $\times 10^{-5}$, 2×10^{-4}; 10, 11.2, 22.5, +, 5×10^{-5}, 1×10^{-4}; 11, [illegible], 8.7, +, 2×10^{-7}, 2×10^{-4}; 12, 4.2, −, −, [illegible] 10^{-4}, 5×10^{-4}; 13, 6.6, −, +, 5×10^{-4}, 2×10^{-4}; 14, 10, −, [illegible], 5×10^{-4}, 1×10^{-4}; 15, 4.5, 7.5, +, 2×10^{-6}, 2×10^{-7}; 16, 3.7, −, −, 4×10^{-4}, 1×10^{-5}. The amides were either noninhibitors of cholinesterase or showed but weak action; thus the values (listed as above) for $Et_2P(O)NEt_2$ were 850, 1125, −, 1×10^{-3}, 2×10^{-3}. G. M. Kosolapoff

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RAZUMOV, A.I.

Distr: 4E4j/4E2c(j)/4E3d

✓**Derivatives of alkylphosphonous and phosphonic acids. VI. Halides and alkylated amides of alkyl(alkoxy)phosphonic acids.** A. I. Razumov, O. A. Mukhacheva, and B. A. Markovich (Chem. Technol. Inst., Kazan). *Zhur. Obshchei Khim.* 27, 2389-94(1957); cf. *C.A.* 51, 16332f; U.S.S.R. 102,461.—To 139 g. EtP(O)(OEt)$_2$ in 2 l. CCl$_4$ was added with stirring in small portions 175 g. PCl$_5$ over 14 hrs. at 26-9°; after stirring 1 hr. the mixt. was distd. *in vacuo* yielding the following: 80% *EtP(O)(OEt)Cl*, b$_{16}$ 73-4°, d$_{20}$ 1.1631, n_D^{20} 1.4338; 80% *EtP(O)(OPr)Cl*, b$_{11-13}$ 85-7°, 1.1303, 1.4400; 45% *EtP(O)(Pr-iso)Cl*, b$_{9.5}$ 76.5-8.5°, 1.1033, 1.4296; 70% *EtP(O)(OBu)Cl*, b$_{10-11}$ 100-2°, 1.0993, 1.4395; 70% *EtP(O)(OBu-iso)Cl*, b$_{9.5}$ 98-9.5°, 1.0898, 1.4355; 60% *MeP(O)(OPr-iso)Cl*, b$_{9.5}$ 36-7°, 1.2024, 1.4346. In the prepn. of the iso-Pr ester of EtPO$_3$H$_2$ a difficulty was encountered in both usual methods of synthesis: the Arbuzov reaction gave a contamination of iso-PrP(O)(OPr-iso)$_2$ from iso-PrI reaction, while the Michaelis reaction gave only the salts, rather than the desired ester. The necessary *EtP(O)(OPr-iso)$_2$*, b$_{13}$ 88-90°, 0.9764, 1.4120, was finally prepd. by oxidation of the EtP(OPr-iso)$_2$ by an unstated method. The chloroesters above are readily hydrolyzed by atm. moisture; with H$_2$O in the presence of a base they yield the corresponding pyrophosphonates; on heating they decomp. to RCl and RPO$_2$. The ester chlorides (1 mole) treated with 2 moles of an amine in Et$_2$O at −15° gave after filtration and distn., the following amide esters, most of which are sol. in H$_2$O: 58% *EtP(O)(OMe)NEt$_2$*, b$_4$ 87-7.5°, 1.0013, 1.4331; 66% *EtP(O)(OEt)NEt$_2$*, b$_{3.5}$ 98-8.5°, 0.9866, 1.4355; 33% *EtP(O)(OPr)NEt$_2$*, b$_2$ 98-9°, 0.9783, 1.4368; 46% *EtP(O)(OPr-iso)NEt$_2$*, b$_{0.5}$ 87-8.5°, 0.9650, 1.4381; 76% *EtP(O)(OBu)NEt$_2$*, b$_1$ 98.5-9.5°, 0.9502, 1.4390; 35% *EtP(O)(OBu-iso)NEt$_2$*, b$_1$ 95.5-7°, 0.9553, 1.4357; 12% *EtP(O)(OC$_6$H$_{13}$)NEt$_2$*, b$_{0.5}$ 110.5-8°,

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A.I. RAZUMOV, O.A. MUKHACHEVA ...

0.9425, 1.4417; 15% $EtP(O)(OC_6H_{11})NEt_2$, b$_{0.4}$ 118-20.5°, 1.0066, 1.4630; 25% $EtP(O)(OCH_2Ph)NEt_2$, b$_2$ 162-3°, 1.0554, 1.4975; 27% $EtP(O)(OEt)NHEt$, b$_{0.5}$ 111.5-12°, 1.0232, 1.4380; 73% $EtP(O)(OBu\text{-}iso)NHEt$, b$_1$ 129-9.5°, 0.974, 1.4358; 76% $EtP(O)(OEt)NMe_2$, b$_{0.5}$ 63-4°, 1.0100, 1.4305; 60% $EtP(O)(OEt)N(CH_2)_5$, b$_{1.5}$ 89-92°, 1.0752, 1.4488 (a 2:1 molar mixt. of reactants); 52% $EtP(O)(OEt)NHCH_2CH_2Cl$, b$_{0.16}$ 144-5°, 1.1515, 1.4565 (an equimolar mixt.); 61% $EtP(O)(OEt)NHCHMe(CH_2)_3NEt_2$, b$_{0.05}$ 153-4°, 0.9594, 1.4530; 55% $EtP(O)(OC_6H_4NO_2\text{-}p)NEt_2$, b$_{0.2}$ 172.5°, 1.1861, 1.5309; 52% $EtP(O)(SEt)NEt_2$, b$_2$ 106-8°, 1.0297, 1.4802. Also were prepd.: 50% $MeP(O)(OMe)NEt_2$, b$_{0.5}$ 71-4°, 1.0214, 1.4355; 50% $MeP(O)(OEt)NEt_2$, b$_{1.5}$ 77-9°, 0.9944, 1.4350; 41% $MeP(O)(OPr\text{-}iso)NEt_2$, b$_{0.1}$ 80-1.5°, 1.0763, 1.4395; 57% $iso\text{-}PrP(O)(OEt)NEt_2$, b$_{0.5}$ 74.5-5°, 0.9709, 1.4360. The amides are readily hydrolyzed, especially in acid solns., and treatment with dil. HCl yields the appropriate pyrophosphonate. The ester amides are biologically active and *inhibit cholinesterase* to the extent of 50% at concns. of 1.5×10^{-6}; with this property, however, their toxicity is low and LD$_{50}$ intravenously for mice ranges from 2.5 to 1308 mg./kg. Most of the ester amides produce myosis which may last up to 50 days in cats and humans. Most of the amides are sol. in H_2O and their solns. are stable for not over 25 days. To 47 g. EtP(O)(OEt)Cl in C_6H_6 and 26.2 g. $NaHCO_3$ (or an equiv. amt. pyridine) was added 0.6 ml. H_2O (exothermic reaction) yielding after filtration 18% $[EtP(O)(OEt)]_2O$, b$_2$ 139.5-41°, d$_{20}$ 1.1333, n_D^{20} 1.4280. The same formed in 50% yield on addn. to 100 ml. Et_2O, 0.5 g. H_2O, and 1.8 g. HCl of 20 ml. Et_2O contg. 6 g. EtP(O)(OEt)NHEt. VII. Mixed esters of primary phosphonic acids. A. I. Razumov, E. A. Markovich, and A. D. Reshetnikova. *Ibid.* 2394-6.—Into a soln. of 13.4 g. $EtP(O)(OEt)H$, b$_{16}$ 77.5°, d$_{20}$ 1.0779, n_D^{20} 1.4262, Cl was passed at −15° until a yellowish color

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A.I. RAZUMOV, O.A. MUKHACHEVA

appeared; after blowing with N 36% $EtP(O)(OEt)Cl$ was obtained. This (204.5 g.) added to 181 g. p-$O_2NC_6H_4OH$ and 1.5 l. dry Et_2O and stirred 45 min., then slowly treated with 132 g. Et_3N in Et_2O, and refluxed 40 min. gave after filtration and distn. (not over 0.2 mm. pressure to avoid decompn.) 61% *$EtP(O)(OEt)OC_6H_4NO_2$-p*, $b_{0.3}$ 163-5°, 1.2545, 1.5242. Similarly were prepd.: 44% *$EtP(O)(OMe)OC_6H_4NO_2$-p*, $b_{0.11}$ 159-60°, 1.3018, 1.5294; 44% *$EtP(O)(OEt)OC_6H_4NO_2$-o*, $b_{0.15}$ 140-2°, 1.2487, 1.5115; 60% *$EtP(O)(OEt)OC_6H_4NO_2$-o(sic)*, $b_{0.14}$ 145-8°, 1.2482, 1.5110; 50% *$EtP(O)(OPr)OC_6H_4NO_2$-p*, $b_{0.3}$ 158-8.5°, 1.2231, 1.5210; 15% *$EtP(O)(OPr$-iso$)OC_6H_4NO_2$-p*, $b_{0.14}$ 161-4°, 1.2286, 1.5233; 57% *$EtP(O)(OBu)OC_6H_4NO_2$-p*, $b_{0.5}$ 181.5-2.5°, 1.1968, 1.5180; 22% *$EtP(O)(OBu$-iso$)OC_6H_4NO_2$-p*, $b_{0.3}$ 163.5-4°, 1.1971, 1.5174; 60% *$EtP(O)(OEt)OC_6H_4Cl$-p*, $b_{0.17}$ 117-18°, 1.2122, 1.5050; 32% *$EtP(O)(OEt)OC_6H_4Cl$-o*, $b_{0.04}$ 106-7°, 1.2065, 1.5045. The esters are slightly sol. in H_2O and are stable in aq. soln. for several years, but are hydrolyzed in alk. solns. All are strong *myotics* and inhibitors of cholinesterase. The Et p-nitrophenyl ester is most active giving myosis at 1:200,000 diln. and having *anticholinesterase activity* at 2×10^{-8} concn. This substance, named Armin, is used clinically for *glaucoma treatment*.

G. M. Kosolapoff

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RAZUMOV, A.I.; MARKOVICH, Ye.A.; RESHETNIKOVA, A.D.

Alkylphosphinous and phosphinic acid derivatives. Part 7: Mixed esters of primary phosphinic acids. Zhur. ob. khim. 27 no.9:2394-2396 S '57. (MIRA 11:3)

1. Kazanskiy khimiko-tekhnologicheskiy institut.
(Phosphinic acid)

RAZUMOV, A. I.

AUTHORS: Razumov, A. I. and Bankovskaya, N. N. 20-2-22/50

TITLE: Production and Some Properties of the Intermediate Products in Arbuzov's Regrouping (Polucheniye i nekotoryye svoystva promezhutochnykh produktov arbuzovskoy peregruppirovki).

PERIODICAL: Doklady AN SSSR, 1957, Vol. 116, Nr 2, pp. 241-243 (USSR)

ABSTRACT: The regrouping known in publications all over the world as Arbuzov's regrouping takes place in 2 phases under formation of an intermediate product. A complete scheme according to Arbuzov is described. About 400 different examples of the regrouping were hitherto described. Other opinions on the regrouping mechanism, however, are also known which assume reactions of an ionic or a radical type. The possibility of a course according to a ionic or radical type in individual cases is not out of the question, but there are very few experimental proofs for this. One of the best proofs of the 2-phase nature of the process is the isolation of intermediate products and their thermal decomposition into a haloid compound and a derivative of phosphinic acids. It was furnished by Arbuzov himself. All

Card 1/4

intermediate products identified were produced by the addition of trivalent phosphorus only to aromatic ethers. 5 of such compounds were thermally decomposed in complete agreement with Arbuzov's regrouping. It was hitherto not possible to isolate the intermediate products which are obtained from the aliphatic ethers of trivalent phosphorus. In most recent times a cyclic intermediate product of the interaction of an aliphatic phosphite with an α-, β-unsaturated aldehyde was obtained by Kamay and Kukhtin. The authors were of the opinion that the above-mentioned intermediate products may best be obtained with such aliphatic derivatives of trivalent phosphorus as may enter the regrouping withouth heating. Ethers of dialkylphosphinic acids proved to be of this type. Not only that they enter reactions with haloidalkyls without heating, some of them even react expolosively under decomposition of the products and separation of iodine vapors. At -6°C this reaction (of methyliodide with ethyl-ether of the ethylphosphinic acid) takes a quiet course and ends after about 30 minutes by formation of a crystalline methyl-diethyl-ethoxy-phosphonium-iodide with a quantitative yield. The interaction of ethyliodide with the same ether takes place at 21°C and ends after 22-23 hours by formation of the crystalline tri-ethyl-ethoxy-phosphonium-iodide. n-propyliodide with the same ether yielded crystals of n-propyl-diethyl-ethoxyphosphonium-iodide. The yields and properties as well as the chemical analyses are given for all these products. All three products spontaneously decompose in a vacuum exsiccator. Their lives are not equal (1o to 25 days) and depend on the structure. They liquefy without previously optically chaniging their crystalline structure. The order of reaction of the first and second phases is not yet quite clear. After the decomposition of the phosphonium compounds phosphine oxides form, according to Arbuzov's regrouping. They apparently are in a solution of the separated haloidalkyls. This is indicated by a strong smell of the latter and by the fact that the vacuum disappeared or was weakened in the exsiccator. The analysis of the oxides was

Production and Some Properties of the Intermediate Products in Arbuzov's regrouping 20-2-22/50

rendered difficult by their extremely high hygroscopy. The nature of the binding of the quasi-phosphonium compounds probably is not purely co-valent or ionic as a rather high dipole-moment was measured for two of them.
There are 18 references, 12 of which are Slavic.

ASSOCIATION: Kazan' Chemico-Technological Institute imeni S. M. Kirov (Kazanskiy khimiko-tekhnologicheskiy institut im. S. M. Kirova).

PRESENTED: By A. Ye. Arbuzov, Academician, May 6, 1957

SUBMITTED: April 3, 1957

AVAILABLE: Library of Congress

Card 4/4

RAZUMOV, A. I.

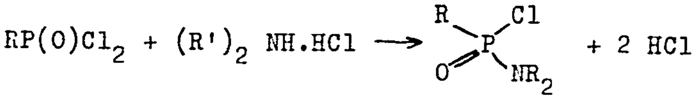
79-1-41/63

AUTHORS: Razumov, A. I. , Mukhacheva, O. A. , Markovich, Ye. A.

TITLE: Investigations in the Series of Alkylphosphinic and Phosphinic Acids (Issledovaniya v ryadu alkilfosfinistykh i fosfinovykh kislot) VIII. Synthesis and Properties of Some Alkylated Amides of Alkylchlorophosphinic Acids (VIII. Sintez i svoystva nekotorykh alkilirovannykh amidov alkilkhlorfosfinovykh kislot)

PERIODICAL: Zhurnal Obshchey Khimii, 1958,Vol.28,Nr 1, pp.194-197(USSR)

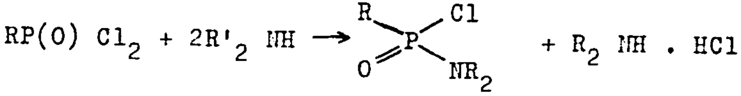
ABSTRACT: In order to come to the alkylated amides of alkylchlorophosphinic acids, two methods were investigated. The first one consisted of the ammonium conversion of the full acid-chlorine-anhydrides with the hydrochlorides of amines according to Michaelis (reference 3):



$$RP(O)Cl_2 + (R')_2\,NH.HCl \longrightarrow R(Cl)P(=O)NR_2 + 2\ HCl$$

Card 1/3

This method gives a yield of 30 - 35 % and requires at least the triple amount of the theoretical yield of chloroanhydride which is for the most part lost. For this reason the authors preferred the method of the partial ammonium conversion of the full chlorine anhydrides of primary phosphinic acids



$$RP(O)Cl_2 + 2R'_2NH \rightarrow R(Cl)P(=O)NR_2 + R_2NH \cdot HCl$$

In this manner they synthesized some representatives of this series of compounds (table 1), whereas the ammonium conversion with primary amines in a vacuum yielded nondistillable and impure products. The alkylated amides of alkylfluorophosphinic acids are liquids with a high slight aromatic smell. They are fairly stable with regard to hydrolysis and are of a high toxic nature. Thus the authors synthesized some representatives of alkylphosphinic acids with mixed functions: alkylated amides of chloro- and fluorophosphinic acids as well as full fluorine anhydrides of alkylphosphinic acids. The authors determined an easy hydrolyzability of the alkylated amides of chlo-

79-1-41/63

Investigations in the Series of Alkylphosphinic and Phosphinic Acids. VIII. Synthesis and Properties of Some Alkylated Amides of Alkylchlorophosphinic Acids

lorphosphinic acids and an instability of the P-N bond in those of fluorophosphinic acids. The easy hydrolyzability of the former already at mere humidity easily leads to alkylated amides of alkylpyrophosphinic acids. Thanks to the instability of the P-N bond in the amides of fluorophosphinic acids on heating full fluorine anhydrides of these acids can be obtained. There are 3 tables, and 13 references, 5 of which are Slavic.

ASSOCIATION: **Kazan' Chemical-Technological Institute**
(Kazanskiy khimio-tekhnologicheskiy institut)

SUBMITTED: November 22, 1956

AVAILABLE: Library of Congress

Card 3/3 1. Chemistry 2. Phospinic acid-Properties 3. Phosphinic acid-Synthesis

RAZUMOV, A.I., Doc Chem Sci--(diss) "Study of the series of derivatives of phosphinic and phosphinous acids." Kazan', 1958. 25 pp (Min of Higher Education. Kazan' Chemico-Technological Inst im S.M.Kirov. Chair of Organic Chemistry), 150 copies. List of author's works, pp 24-25 (26 titles) (KL,45-58, 142)

RAZUMOV, A.I.

Synthesis of some phosphinic acid derivatives having antibacterial activity. Trudy KKHTI no.26:123-134 '59. (MIRA 15:5)

1. Kafedra organicheskoy khimii Kazanskogo khimiko-tekhnologicheskogo instituta imeni S.M.Kirova.
(Phosphinic acid) (Antibiotics)

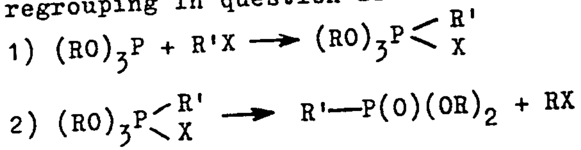
5(3) SOV/79-29-5-48/75

AUTHOR: Razumov, A.I.

TITLE: On the Mechanism of the Arbuzov Regrouping (O mekhanizme arbuzovskoy peregruppirovki)

PERIODICAL: Zhurnal obshchey khimii, 1959, Vol 29, Nr 5, pp 1635-1639 (USSR)

ABSTRACT: A report of the work under review was delivered on the occasion of a meeting held by the Chemical Institute of the AS USSR in Kazan' on September 27, 1957. The general scheme of the regrouping in question is as follows:



$$1)\ (RO)_3P + R'X \longrightarrow (RO)_3P\begin{matrix}\diagup R' \\ \diagdown X\end{matrix}$$

$$2)\ (RO)_3P\begin{matrix}\diagup R' \\ \diagdown X\end{matrix} \longrightarrow R'\text{—}P(O)(OR)_2 + RX$$

This scheme is substantiated both by means of chemical and physical methods. Publications supply other explanations of the reaction mechanism. So-called abnormal cases were described (Refs 8-22). Many data are not proven in a convincing way. As concerns the abnormal cases, reactions between phosphites and α-halogen aldehyde, α-halogen ketone and other α-halogen

Card 1/3

On the Mechanism of the Arbuzov Regrouping SOV/79-29-5-48/75

carbonyl compounds, esters of phosphoric acid, that means P-O-compounds and no P-C-compounds are formed. The author considers also these cases as being normal. The concept of regrouping must be extended so as to include these cases as well. The course of reaction may probably depend on the electron structure of the reagent and on polarization. The reaction rate in regrouping was investigated by the author on the ethyl ester of the phosphorous acid and on the ethyl esters of ethyl- and diethyl phosphinic acids. Measuring results are shown in a table. The tendency of trivalent phosphorus toward affiliation falls in the series $R_3P > R_2POR > RP(OR)_2 > P(OR)_3$. Amine traces retard regrouping. The experimental part describes the reaction course of $(C_2H_5O)_3P + C_2H_5J$; $C_2H_5P(OC_2H_5)_2 + C_2H_5J$; $(C_2H_5)_2POC_2H_5 + C_2H_5J$. There are 1 table and 31 references, 15 of which are Soviet.

Card 2/3

On the Mechanism of the Arbuzov Regrouping SOV/79-29-5-48/75

ASSOCIATION: Kazanskiy khimiko-tekhnologicheskiy institut (Kazan' Institute of Chemical Technology)

SUBMITTED: March 31, 1958

Card 3/3

5.3630 2220, 2209

31551
S/081/61/000/022/023/076
B110/B138

AUTHORS: Razumov, A. I., Liorber, B. G.

TITLE: Butyl ester of allyl phosphinic acid, its properties, and chemical conversions

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 22, 1961, 207, abstract 22Zh233 (Tr. Kazansk. khim.-tekhnol. in-ta, no. 29, 1960, 27-28)

TEXT: $RP(OC_4H_9)_2$ (I; here and below, $R=CH_2=CHCH_2$) was synthesized. With addition of S, Se, by reaction with C_4H_9I (118°C, 20 min) the following products were obtained: $RP(S)(OC_4H_9)_2$ (II), $RP(Se)(OC_4H_9)_2$ (III), and $R(C_4H_9)P(O)OC_4H_9$ (IV). The products are indicated along with their boiling points in °C/mm Hg, n_D^{20}, d_4^{20} : I, 102.5-103/10, 1.4465, 1.0906. II, 136-139/10, 1.4717, 0.9865. III, 145-147/10, 1.4889, 1.1457. IV, 139-140/12, 1.4522, 0.9480. By reaction of IV with Br_2 an additive product with bromine was obtained. [Abstracter's note: Complete translation.]

X

Card 1/1

86838

5.3630 2209, 1266, 1287 S/020/60/135/005/028/043
B016/B052

AUTHORS: Razumov, A. I. and Liorber, B. G.

TITLE: Investigation of the Derivatives of Phosphinic and Phosphinous Acids. Synthesis and Properties of the Dibutyl Ester of Allyl Phosphinous Acid

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 5, pp. 1150-1152

TEXT: The authors studied the synthesis of esters of phosphinous acids and their derivatives (Refs. 2, 3). In this paper, they describe the synthesis of dibutyl ester of allyl phosphinous acid (DBEAPA) and some of its conversions. The ester was synthesized by reaction of allyl magnesium bromide with dibutyl chloro-phosphite at -60°C (Ref. 1) in dry ether. Complexes with halide salts of Mg did not form. DBEAPA is a colorless liquid with a characteristic phosphinic smell, and when poured on paper or cotton wool, it enters into a vigorous reaction with atmospheric oxygen under the formation of smoke. In order to verify the structural formula suggested by them for DBEAPA, the authors compared several addition reactions to

Card 1/4

86838

Investigation of the Derivatives of Phosphinic and Phosphinous Acids. Synthesis and Properties of the Dibutyl Ester of Allyl Phosphinous Acid

S/020/60/135/005/028/043
B016/B052

its phosphorus atom and double bond with those of the dibutyl ester of vinyl phosphinic acid (Ref. 1). Thus, the divergence in the behavior of these two esters was ascribed to the different positions of the double bond with respect to the phosphorus atom. DBEAPA and CuI react with a rise in temperature. The reaction of the former with sulfur and selenium is vigorous and causes the formation of the corresponding esters of allyl-thio and allyl-selenium phosphinic acids. The Arbuzov rearrangement (not explained here) in the case of DBEAPA occurs easily(with butyl iodide in a sealed tube at 117°C), and is finished within 20 min. The trivalent structure of phosphorus is thus proved. It is noted that presence of a double bond may be proved by the chlorination of the isomerized product at -5 + 0°C whereby the butyl ester of butyl-β,γ-dichloropropyl phosphinic acid was formed. It is not able to withstand high temperatures and partly decomposes during distillation while HCl is separated. Table 1 shows the constants and analytical data of the synthesized compounds. There are 1 table and 7 references: 6 Soviet and 1 French.

Card 2/4

86838

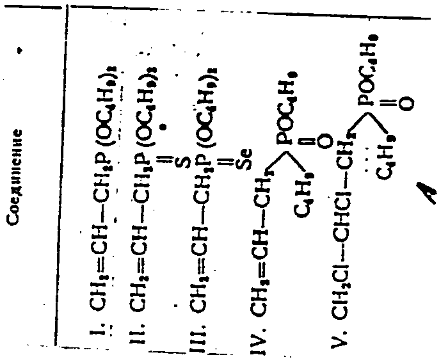
Investigation of the Derivatives of Phosphinic and Phosphinous Acids. Synthesis and Properties of the Dibutyl Ester of Allyl Phosphinous Acid

S/020/60/135/005/028/043
B016/B052

ASSOCIATION: Kazanskiy khimiko-tekhnologicheskiy institut im. S. M. Kirova (Kazan' Institute of Chemical Technology imeni S. M. Kirov)

PRESENTED: June 29, 1960, by A. Ye. Arbuzov, Academician

SUBMITTED: June 27, 1960



I. $CH_2=CH-CH_2P(OC_4H_9)_2$

II. $CH_2=CH-CH_2\underset{\overset{\|}{S}}{P}(OC_4H_9)_2$

III. $CH_2=CH-CH_2\underset{\overset{\|}{Se}}{P}(OC_4H_9)_2$

IV. $CH_2=CH-CH_2\underset{\overset{\|}{O}}{P}(C_4H_9)OC_4H_9$

V. $CH_2Cl-CHCl-CH_2\underset{\overset{\|}{O}}{P}(C_4H_9)OC_4H_9$

Card 3/4

26302
S/190/61/003/008/015/019
B110/B208

15.8110

AUTHORS: Krivosheyeva, I. A., Razumov, A. I., Kolesnikov, G. S.

TITLE: Studies in the series of derivatives of phosphinic and phosphinous acids. XIV. Study of polymerization of some unsaturated esters of ethyl phosphinic acid

X

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 8, 1961, 1247 - 1250

TEXT: Following a paper by A. I. Razumov (Dissertatsiya, Kazan', 1957) reporting on the polymerizability of unsaturated esters of the R-P(O)(OR')·OCH=CCl_2 type, the authors studied the polymerization of these esters. Preliminary experiments with methyl-2, 2-dichlorovinyl ester of ethyl phosphinic acid (ME) and with the same ester of phenyl phosphinic acid in the presence of $AlCl_3$ at 100°C were unsuccessful. The allyl-2, 2-dichlorovinyl ester of ethyl phosphinic acid (AE) was then synthesized. The following polymerization experiments were carried out with both esters: (1) at 100°C in the presence of tert-butyl peroxide;

Card 1/3

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B110/B208

Studies in the series...

(2) at different temperatures in the presence of azoisobutyric acid dinitrile; (3) in methylene chloride medium at -50°C in the presence of 2 mole% $TiCl_4$; (4) in hexane medium at -20°C in the presence of butyl lithium (concentration of monomer 1 mole/liter, of the catalyst 0.03 - 0.05 moles/liter). In the case of AE, viscosity increased; with ME, no polymerization took place. Copolymerization of ME and AE with methyl methacrylate (MMA) and styrene was studied. The following was found: (1) with increasing concentration of the phosphorus-containing component, yield and intrinsic viscosity decrease, P and Cl content increase; (2) copolymers of AE and ME with styrene are not easily inflammable; (3) copolymers of ME + MMA burn; (4) only the copolymer AE + MMA containing 10% AE is completely soluble in acetone. The soluble copolymers AE + MMA are not easily inflammable, the unsoluble ones do not burn; (5) the softening temperatures of copolymers of ME and AE with styrene differ only slightly from that of polystyrene. The thermomechanical properties of MMA copolymers were not studied. The authors thank G. L. Sloninskiy for determining the thermomechanical properties, S. R. Rafikov and S. A. Pavlova for determining the molecular weights There are 1 figure, 2 tables, and 3 references:. 2 Soviet-bloc and 1 non-Soviet-bloc. The reference to the

Card 2/3

RAZUMOV, A.I.; ZABUSOVA, N.G.

Phosphinic and phosphonic acid series. Report No.14: Some derivatives diethylcarboxymethylphosphine oxide. Trudy KKHTI no.30:28-36 '62.

Phosphinic and phosphonic acid series. Report No.15: Atomic refraction of phosphorus in phosphine oxides. 37-39 (MIRA 16:10)

RAZUMOV, A.I.; LIORBER, B.G.; MOSKVA, V.V.; KHAMMATOVA, Z.M.

Preparation of dialkyl phosphorous acid chlorides. Trudy KKHTI no.30:265-270 '62. (MIRA 16:10)

RAZIMOV, A.I.; ZABUSOVA, N.G.

Phosphinic and phosphonic acid series. Part 14: Mechanim of the reaction of esters of trivalent phosphorus with esters of halogen-substituted acids. Zhur.ob.khim. 32 no.8:2688-2691 Ag '62. (MIRA 15:9)

1. Kazanskiy khimiko-tekhnologicheskiy institut.
(Phosphinic acid) (Phosphonic acid)

RAZUMOV, A.I.; ZABUSOVA, N.G.

Derivatives of phosphinic and phosphonic acids. Part 15: Atomic refraction of phosphorus in phosphine oxides. Zhur.ob.khim. 32 no.8:2691-2693 Ag '62.
(MIRA 15:9)

1. Kazanskiy khimiko-tekhnologicheskiy institut.
(Phosphorus--Optical properties)
(Phosphine oxide)

MUKHACHEVA, O.A.; RAZUMOV, A.I.

Derivatives of phosphinic and phosphonic acids. Part 16: Synthesis of alkylated amides of dialkylphosphinic acids. Zhur.ob.khim. 32 no.8:2693-2696 Ag '62. (MIRA 15:9)

1. Kazanskiy khimiko-tekhnologicheskiy institut.
(Phosphinic amide)

MUKHACHEVA, O.A.; RAZUMOV, A.I.

Derivatives of phosphinic and phosphonic acids. Part 17: Dialkylphosphinic amides. Zhur.ob.khim. 32 no.8:2696-2699 Ag '62. (MIRA 15:9)

1. Kazanskiy khimiko-tekhnologicheskiy institut.
(Phosphinic amide)

RAZUMOV, A. I.; LIORBER, B. G.

Derivatives of phosphinic and phosphinous acids. Part 18: Synthesis and properties of dihexyl ester of allylphosphinous acid. Zhur. ob. khim. 32 no.12:4063-4066 D '62.
(MIRA 16:1)

1. Kazanskiy khimiko-tekhnologicheskiy institut imeni S. M. Kirova.

(Phosphinous acid)